2017

16 year old baseball pitcher presenting with gradual worsening of posterolateral right elbow pain and negative MRI findings

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Elbow Synovial Fold Syndrome

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Editors: Reema Sheth, D.O.; Nisha Sheth, B.S.

Introduction

Elbow pain is a common presenting symptom in repetitive motion performing athletes. Due to the popular use of prolonged conservative therapy initially and the importance of early surgical intervention in Elbow Synovial Fold Syndrome, proper and prompt diagnosis is essential. As ESFS is an uncommon diagnosis, this case report analyzes the common presenting symptoms, how best to correctly narrow the differential diagnosis and how to proceed with effective treatment.

Elbow synovial fold syndrome (ESFS) or Elbow Plicae Syndrome is thought to result from repetitive impingement of redundant synovial folds, causing inflammation secondary to cytokine-mediated factors [1]. Plicae are folds of synovial membrane that are thought to be remnants of embryonic connective tissue that failed to fully resorb during fetal development[2]. They are present in 80% of the population, but are usually asymptomatic.
Function of plicae:
1. Stabilizers to prevent excessive movement.
2. Distribute synovial fluid throughout the joint.
3. The rich innervation in the plica helps play a role in nociception, proprioception and coordination of movement[2].
In the elbow joint, a synovial radiohumeral plica is a physiologic condition. It only becomes pathologic in cases where the plica hypertrophies and dislocates into the radiohumeral articulation, causing pain [3].

Embryology, Anatomy, Histology

In embryonic development, the elbow joint forms by mesenchymal cavitation sequentially at the radiohumeral site, ulnohumeral region, and ending at the radioulnar site. Thereafter, all three cavities merge. The plicae are septal remnants of this process [2].

The radiohumeral synovial plicae occur on the medial side of the annular ligament (AL) (Figure 1). Although they are contiguous with the radiocapitellar joint capsule, they are still distinct from the annular ligament. The elbow synovial plicae are located at the radiohumeral joint and encompass the peripheral margins of the radial dome [2].

There are 4 aspects of the radio-humeral synovial fold clearly differentiated by location (Figures 2 and 3):

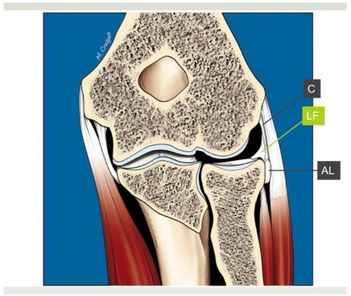
The posterolateral (PF) synovial fold is the most common (86%-100%), located between the lower sigmoid cavity (SC) of the ulna, radial head (RH), and the transverse sulcus of the major sigmoid cavity[2]. The anterior fold (AF) (67% of cases) is a thin anterior part of the radio-humeral fold
The lateral olecranon fold (OF) originates from the posterolateral fold and travels proximally along the olecranon's lateral periphery, with its rounded apex located at the peak of the lateral non-articular portion of the trochlear notch
The lateral fold (LF) is a horizontal meniscoid fold in the radio-humeral joint lying amid the capitellum (C) and the outer perimeter of the radial dome [2].

The synovial fold is composed primarily of fibroadipose tissue and significant amounts of nerve endings in the periphery, along with moderate vascularization. The differentiating trait between the fold and a meniscus is the lack of fibrocartilage [2].

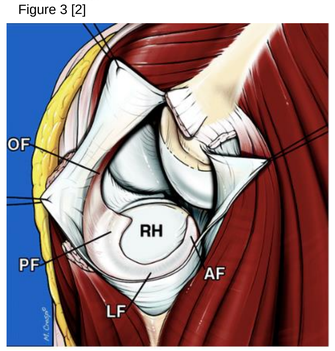
Mechanism of Damage

Inflammation secondary to repeated impingement usually results from repetitive hyperextension of the joint, blunt trauma, fat pad irritation, internal elbow derangements, and overloading. As the plica enlarges due to inflammation, it can be compressed between the articular surfaces during elbow flexion and extension, resulting in a "snapping" sensation at the joint at around 80-100 degrees of elbow flexion

Frontal diagram of radiohumeral joint shows normal "pseudomeniscoid" appearance of lateral radiohumeral fold, located between capitellum and edge of fovea
radialis, fixed to capsule above superior edge of annular ligament. AC = articular capsule, LF = lateral fold.
Figure 1 [2]

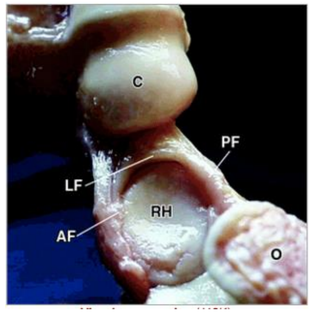


Anatomy of radiohumeral synovial fold. Diagram of elbow joint laterally opened shows normal appearance of elbow synovial plicae (circular-type fold). AF = anterior fold, LF = lateral fold, PF = posterolateral fold, OF = lateral olecranon fold, RH = radial head.
Figure 3 [2]

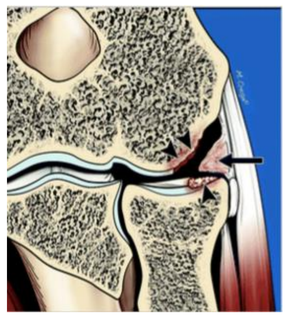


MR arthrography showing a thickened posterolateral(PL) plica and focal irregular synovitis Figure 4 [2]

Cadaveric dissection images show normal radiohumeralsynovial fold (circular-type fold). LF = lateral fold PF = posterolateral fold, OF = lateral olecranon fold, RH = radial head, O = olecranon, C = capitellum, SC = sigmoid cavity, TH = trochlea of humerus.
Figure 2 [2]



Typical features of elbow synovial fold syndrome, including thickened and inflamed plica (arrow) and chondral fraying of radial head and capitellum (arrowheads).
Figure 5 [2]



Diagnosis/Treatment

Clinical symptoms include motion-dependent pain in the elbow joint area and a snapping sensation with elbow flexion. Reduced range of motion, erythema, and swelling may also be present. Patients are usually involved in sports requiring repetitive motions of the elbow (i.e. tennis, baseball, cheerleading, golf, weightlifting). Although radiographs are not useful in diagnosis, they are still usually the initial imaging study ordered [9].

The high-definition ultrasound and arthroscopic examination of the joint are likely the most valuable tools as they allow not only direct inspection of the hypertrophic plica, but also help identify the dynamic impact of the hypertrophic folds in motion [3].

ESFS can commonly be misdiagnosed as lateral epicondylitis, osteochondrosis dissecans, loose bodies, arthritis, compression of the posterior interosseous nerve, or snapping of the triceps tendon [11].

Tx: First line initially is rest from all strenuous activities, combined with NSAIDs, and physiotherapy [13]. Upon failure of conservative therapy (3 months duration) arthroscopic excision of the pathologic plica is usually done[14]. Early diagnosis and treatment are essential. Surgical intervention should not be delayed for lengthened conservative management past 3- 6 months at the latest. Erosion of the articular cartilage (Figure 5) will occur which would be prevented by earlier resection [2,4]. However, surgery can lead to complications; conservative management is initially recommended for at least 8 weeks. Outcomes after arthroscopic resection, focal fibrosis, and repair of chondral defects are excellent. In rare cases, open surgery is necessary when large hypertrophic synovial plicae are present [3].

Discussion

Conclusions: Elbow synovial fold syndrome can be found in athletes, especially those in sports that require repetitive motion of the elbow. It can be easily misdiagnosed. As in our case, even an MRI may show negative findings early on. CT or MR arthrography, along with dynamic US, are helpful in diagnosing ESFS. A short course of conservative therapy is appropriate, however, If conservative therapy fails, then arthroscopic excision is appropriate. As was noted in our literature search, cases on ESFS are lacking and the topic would benefit from retrospective data collection over large populations and a broad time period.

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